Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Use of Spectrum Bands Above 24 GHz For Mobile Radio Services	)	GN Docket No. 14-177
Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands	)	IB Docket No. 15-256
Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band	)	RM-11664
Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services	)	WT Docket No. 10-112
Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations	)	IB Docket No. 97-95
Amendment of Part 101 to Facilitate Wireless Backhaul	)	WT Docket No. 10-153
Requests of Aviat Networks and CBF Networks, Inc. d/b/a Fastback Networks for Waiver of Certain Antenna Requirements in the 71-76 and 81-86 GHz Bands	)	WT Docket No. 15-244

REPLY COMMENTS OF COLLINEAR NETWORKS, INC. ON THE FURTHER NOTICE OF PROPOSED RULEMAKING

Collinear Networks, Inc. ("Collinear Networks"), by its attorneys, hereby submits these replies to the first round comments on the Commission's Further Notice of Proposed Rulemaking in the above-captioned proceedings.[1] As explained herein, the initial comments demonstrate a broad level of opposition to importing into the 71-76 and 81-86 GHz bands (the "70/80 GHz Bands") a spectrum access system ("SAS") framework to govern access. In addition, the Commission should not introduce flexible mobile use into the 70/80 GHz Bands at this time because, as the comments make clear, the feasibility of sharing with existing fixed wireless services in the bands is unclear and requires additional study. Premature introduction of other services into the bands would threaten investment into fixed wireless technologies operating in the 70/80 GHz Bands and the deployment and expansion of systems that will be important for various industry sectors, including 5G wireless communications. Consideration of the introduction of any services into the 70/80 GHz Bands must have the protection of the current fixed wireless uses, including not only incumbent licensees and currently registered links but new users and the expansion of existing networks, as a central principle.

1. The Commission Should Not Adopt an SAS framework in the 70/80 GHz Bands.

In the *Further Notice*, the Commission specifically sought comment on whether it should consider adoption of a three-tiered SAS for regulating use of the 70/80 GHz Bands.[2] There is a strong consensus from all industry sectors – fixed providers,[3] mobile carriers and trade

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1 In the Matter of Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al., Report and order and Further Notice of Proposed Rulemaking, GN Docket No. 14-177, et al., FCC 16-89, released July 14, 2016 (as applicable, "Report and Order" or "Further Notice").

2 Further Notice ¶ 440.

3 *See, e.g.,* Comments of FWCC at 11; Comments of Siklu, Inc. at 3; Comments of Fastback Networks at 3. References to comments of other parties in these Reply Comments are to comments in GN Docket No. 14-177 filed on September 30, 2016.

associations,[4] and others[5] -- that an SAS-based access system should not be adopted in the 70/80 GHz Bands because use of such an unproven system to replace the currently successful framework would be complex and spectrally inefficient. While there are a few isolated commenters that appear to support adoption of an SAS, they neither substantially support their position nor counter the many concerns of the opponents of such a plan.[6] There is no basis for the Commission to move forward with further consideration of an SAS approach at this time.

2. The Commission Should Not Introduce Mobile Use into the 70/80 GHz Bands

In its comments, Collinear Networks opposed the opening up of the 70/80 GHz Bands to flexible mobile uses through some modification of the existing regulatory framework.[7] Taking

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[4] *See, e.g.,* Comments of T-Mobile at 19-20; Comments of AT&T at 11 (the SAS-approach is not "a panacea"); Comments of CTIA at 3 ("retain a modified version of the existing licensing framework in the 70/80 GHz bands rather than experimenting with a spectrum access system ("SAS")-type regime in those bands"); Comments of 5G Americas at 7 ("[T]he SAS is not needed in this band. The concept is new, unproven and complex"); Comments of the Competitive Carriers Association ("CCA") at 5. *See also* Comments of Nokia at 14.

[5] *See, e.g.,* Comments of Google at 3 ("licensing and incumbent protection zones [similar to those] specified in the 3.5 GHz CBRS rules would impair more spectrum than necessary, significantly reducing efficiency [in the 70/80 GHz Bands]"); Comments of TIA at 14-15; Comments of Comsearch at 4; Comments of Huawei at 10 ("FCC should retain the current sharing system in this band, which has been proven over decades of use, rather than introducing the CBRS-like sharing process."); Comments of Qualcomm at 12; Comments of Mobile Future at 4 ("The three-tiered sharing framework has not yet been tested, and . . . extending use of a SAS to the mmW bands would be premature.").

[6] Aeronet, for example, advocates for the adoption of an SAS-based approach for permitting access to the 70/80 GHz Bands. *See* Comments of Aeronet at 5. While Aeronet spends a lot of attention on how an SAS-regulatory framework might be constructed, it does not offer a reason why, as a threshold matter, such an approach should be adopted or counter the many claims that the totally-novel SAS approach is unproven and, in these frequencies, totally unnecessary. Sony, an applicant to be an SAS administrator in the 3.5 GHz band does not detail why an SAS-approach should be extended to the 70/80 GHz Bands on a "promise" in light of the success of the current light-licensing approach. One is left to suspect that Sony sees an opportunity to leverage its potential selection at 3.5 GHz to another band. *See* Comments of Sony at 2-3 (urging adoption, with modifications, of the "same spectrum-sharing mechanism in the 70/80 GHz bands that is showing such promise in the 3.5 GHz band").

[7] *See* Comments of Collinear Networks at 11-15.

the same position as Collinear Networks, there was a strong consensus amongst other fixed services providers and advocates that the Commission should not introduce mobile services at this time because any action to modify the existing regulatory framework within the 70/80 GHz Bands to try to accommodate mobile use was likely to undermine continued investment in fixed link technologies and deployments.[8] Collinear Networks concurs with the Telecommunications Industry Association and others that not only must incumbents' existing fixed services links be preserved, but users of fixed links must be able to continue to expand their deployments as their needs change and grow.[9]

Moreover, Collinear Networks urges the Commission to ensure that new users have the opportunity to obtain fixed services licenses in the 70/80 GHz Bands and deploy links with the same protections as incumbents.[10] Further, new competitors seeking to improve fixed services technologies or to become service providers themselves should also be encouraged. The

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[8] *See, e.g.*, Comments of FWCC at 11 ("The Commission should not jeopardize ongoing investment in the [70/80 GHz bands] by introducing unnecessary uncertainty" by permitting mobile operations in the bands); Comments of Siklu, Inc. at 2 ("We are worried that any adverse change in the protection of fixed services will introduce a level of uncertainty that will reduce competition in the broadband backhaul, raise costs for consumers, and slow the deployment of 5G networks").

[9] *See* Comments of TIA at 14 ("it is essential that the established use of these bands for fixed point-to-point links should be permitted to thrive – and expand"); Comments of the National Spectrum Management Association at 4 ("Changes to the rules must protect these existing systems [at 70 and 80 GHz] and allow future fixed systems to be licensed under current rules. . . . Fixed services often support public safety, transportation or critical personal communications where reliability and availability are critical."); Comments of 5G Americas at 6 ("It is essential that the current use of the band should be allowed to continue to expand. . . . The attractiveness of the 70/80 GHz band . . . is now rapidly increasing. . . . It is expected that high-capacity-demand backhaul will transition from lower bands to the 70/80 GHz band, especially in support of 5G. As more mmW spectrum bands are made available, the demand for this backhaul band will increase").

[10] Collinear Networks agrees with Scientel Solutions that "protection of incumbents against harmful interference will mean that incumbents will be no worse off vis-à-vis such interference in a shared-use environment than they are today." *See* Comments of Scientel Solutions at 4.

advantages of the mmW technologies in these bands should not be limited to those that have already obtained licenses. Protection of existing investments that Collinear Networks and others have made and the encouragement of future investments to advance 70/80 GHz Bands fixed services technologies will not be achieved solely by supporting incumbent licensees.

The record generated in response to the *Further Notice* demonstrates considerable doubt that mobile services can effectively share with fixed services in the band.[11] Many other commenters join Collinear Networks in its position on the grounds that the introduction of mobile services would be premature.[12] Indeed, as a general matter, the Commission should first

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[11] *See, e.g.,* Comments of TIA at 14 (fixed services and mobile "testing should also encompass coexistence between different entities" in the 70/80 GHz Bands). FWCC, like Collinear Networks, noted that the *Further Notice's* suggestion that the majority of the country is "greenfield" relative to possible mobile deployment within the 70/80 GHz bands is "misleading," as the most heavily registered areas for fixed links are in the same locations where the "greatest demand for mobile service will come." Comments of FWCC at 9-10. *See also* Comments of Collinear Networks at 11-12. The FWCC correctly concluded that "[t]he existence of lightly-used 70/80 GHz spectrum in other, lightly-populated areas does not predict a lot of available spectrum for mobile service where needed." Comments of FWCC at 10. Thus, claims of such commenters that current use of the band creates a greenfield for mobile deployment overlook the reality that fixed and mobile demand is usually co-located and are effectively baseless. *See, e.g.,* Comments of Qualcomm at 12 (claiming "there is space for potential mobile operations" because "the bulk of the registered links are located in just 16 counties,").

[12] *See, e.g.,* Comments of the National Spectrum Management Association at 4 ("The NSMA does not support allowing mobile radio use of [the 70/80 GHz bands] at this time. . . .. Mobile and fixed users often have significantly different needs regarding protection and timely resolution of problems."); Comments of 5G Americas at 8 ("more study is needed to determine coexistence of mobile with fixed services in [the 70/80 GHz] bands, including the development of novel mitigation techniques as well as a licensing process that accommodates flexible use and the respective differences of mobile area-based operation and point-to-point operation"); Comments of Comsearch at 4 ("more study is needed to determine the details of coexistence between mobile and fixed services"); Comments of Scientel Solutions, LLC at 3 (it is "essential . . . to ensure compatibility with fixed wireless links"" based on consensus scientific findings" "without disrupting those existing systems"); Comments of TIA at 14 ("While the prospect of mobile service in the bands is enticing, at present there are no studies showing that sharing between mobile and fixed point-to-point uses are possible. . . . [T]he Commission's analysis [in the *Further Notice*] cannot substitute for more empirical evidence."); Comments of CCA at 9-10 ("the Commission should allow stakeholders more time to determine what use cases may apply to the proposed bands, and not rush into adopting inflexible rules").

come to understand much more about how mobile services can and will use the substantial mmW bands already made available for mobile use in the *Report and Order* in this proceeding before making additional mobile allocations.

In any event, even were the Commission to decide in the future to permit flexible mobile use of a portion of all of the 70/80 GHz Bands, the Commission should reject the calls of T-Mobile and several mobile service providers to provide for exclusive licensing to mobile operators.[13] Exclusive licensing would undercut incumbent and new providers of fixed links in the 70/80 GHz Bands, frustrating their efforts to deploy and expand their fixed link networks and facilities.[14] In general, Collinear Networks agrees with Lockheed Martin that the Commission should not adopt "rules and policies that serve only the terrestrial mobile broadband service concept," but encourage a variety of uses in the new mmW bands.[15] But the Commission must also protect the investments that have been made in reliance on existing licensing frameworks. It is especially important that, in order to protect the investments that Collinear Networks and others have made in developing and enhancing the fixed technologies in the 70/80 GHz Bands, the Commission rejects the arguments of several parties that any grandfather rights of incumbent users be limited in time.[16]

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13 *See, e.g.*, Comments of T-Mobile at 20 ("[T]he Commission should adopt exclusive geographic licensing"); Comments of AT&T at 13.

14 In its comments, CTIA asks the FCC to keep but modify the current licensing system to accommodate mobile usage, suggesting that it can be accomplished presently but offering little detail. CTIA claims that "[t]he database could be modified to account for new, mobile uses in the 70/80 GHz bands while still fully protecting incumbent fixed microwave links, [ensuring] that these bands are put to their most efficient 5G use." Comments of CTIA at 15. However, the trade association does not specify exactly how this would be done, preventing any assessment of the suggestion's worth.

15 *See* Comments of Lockheed Martin at 13.

16 *See, e.g.*, Comments of T-Mobile at 20 ("Federal and non-federal incumbent users should be grandfathered during a specified transition period . . . after which non-federal incumbent users would either need to obtain licenses through auction or secondary markets or seek agreements

Collinear Networks reserved comment in its initial comments on the suitability of any particular airborne systems introduced in the 70/80 GHz Bands,[17] and reiterates that intent here. Aeronet in its comments proposes a new Class of Mobile Licenses in the band, which it characterizes as mobile "Class C licenses" operating at 3,000-60,000 feet.[18] Aeronet fails to offer enough information and analysis to assess whether such devices would operate with enough spatial and spectral differentiation to enable compatible use with fixed services operating under the current rules. Like other prospective mobile uses, more study is needed before such mobile aeronautical operations can be permitted in the band without creating an undue potential for interference to fixed links operating under the current regulatory framework.

3. The Commission Should Not Relax Antenna Requirements in the 70/80 GHz Bands.

Not only should the Commission preserve the 70/80 GHz Bands for fixed links, it should decline at this time to relax the antenna requirements of fixed link equipment, as Collinear Networks explained in its opening comments.[19] The antenna requirements in E-band should not be relaxed *even for antennas placed close to the ground*.[20] While a larger beamwidth allowance

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with licensees to remain protected."); Comments of InterDigital at 5 ("[E]xisting non-Federal licensees and registered links should be grandfathered in the band(s) for a specific amount of time sufficient to permit a smooth transition. After this grace period they should be required to transition to the new service rules.").

17 *See* Comments of Collinear Networks at 10, n. 16. Certain airborne platforms may present a potential interference threat in both directions to fixed links on the ground, for example, if the airborne platform is communication with ground terminals at very low elevation angles, i.e., angles slightly above the horizon. This threat may be magnified in the case of mobile platforms.

18 Comments of Aeronet at 8.

19 Comments of Collinear Networks at 15-16, n. 25.

20 Several commenters argue for relaxed antenna requirements. *See, e.g.*, Comments of FWCC at 11 (the "current 70/80 GHz rules [should] be redesignated Class A and be made applicable to antennas mounted on or above a building at least two stories in height, or on a tower at least 6 meters off the ground" and relaxed antenna standards should apply to lower Class B antennas); Comments of Siklu, Inc. at 3 ("relax the beam width requirement to 2.2-3

for antenna "close to the ground" may sound at first blush like a promising idea, Collinear Networks is concerned that in many cases private line or back haul line-of-sight paths using narrow beamwidths under the current rules may, for good reason, also be close to the ground. Larger beamwidths will increase the probability of interference to such fixed links. Operators complying with the current antenna requirements should not have to incur additional expense – by raising equipment higher off the ground to create spatial diversity and avoid interference. Nor should they be compelled to go through a more complicated, and inevitably costly coordination process to accommodate antennas operating pursuant to relaxed requirements, which would undermine the efficiency and effectiveness of the light-licensing framework in place today.[21]

Finally, Collinear Networks contends that the public policy basis offered for relaxing the antenna requirements – promoting fuller deployment of 70/80 GHz Band fixed links has not been demonstrated. Collinear Networks itself has invested millions of dollars in developing the technologies, and will soon launch its products, without any reliance on or anticipation of the antenna requirements being relaxed. Indeed, Collinear Networks has presumed quite the

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degrees"); Comments of Fastback Networks at 3 ("relax the beam width requirement to 4 degrees"); Comments of CTIA at 15 ("relax the allowed beamwidth for antennas below ten meters to 3 degrees"); Comments of Google at 5 (arguing for minimum gain of 38 dBi versus the current 43 dBi, to being into line with ETSI standards) Google tries to justify a relaxation of the antenna standards by contending that "lowering the minimum antenna gain will not increase the risk of harmful interference. It would simply be a factor considered in the coordination process, with the large amount of available 70/80 GHz spectrum affording ample room for successful arrangements." Google's argument is essentially a truism and completely ignores the overall reduction of spectral efficiency and increased chance that successful coordination will not be possible if the antenna standards are relaxed as it and others advocate.

[21] As Collinear Networks noted in its opening comments, the sort of operations that proponents hope a relaxation of antenna requirements might introduce can be accommodated in other spectrum bands so as to not compromise the spectral efficiency of current uses of the 70/80 GHz Bands. *See* Comments of Collinear Networks at 16-17.

opposite. In any event, there are other ways to meet the need for shorter haul, lower power links: licensed fixed links in other frequency bands or unlicensed links.

4. Google's "Polygon" Coordination Proposal Would Degrade Spectral Efficiency and, in Any Event, Is Not Ripe for Consideration.

Google in its comments proffered the concept of coordinating fixed services in the 70/80 GHz Bands not on a link-by-link basis but through geographic coverage areas or "polygons" in which operators specify probability density functions that a beam will be directed to each point within the "polygon."[22] Google apparently has in mind coordination of two or more point-to-multipoint systems with dynamic, hopping beam patterns. Collinear Networks is concerned that such beam-hopping systems, coordinated based on the statistical probability of collision interference, will have the potential to degrade the latency of, and induce jitter into, fixed point-to-point links operating on a continuous basis and coordinated under the current framework. Google's suggested changes to that framework would undermine the total spectral efficiency of the 70/80 GHz Bands. If a provider of a point-to-multipoint configuration were able to coordinate throughout a defined "polygon," as Google suggests, that would make it more difficult for point-to-point link operators to coordinate and register links with one or more end points located within the "polygon." In short, although many of the details of Google's proposal would have to be further articulated to allow full evaluation, a licensee with a coordinated "polygon" might inadvertently enjoy some sort of *de facto* priority over other licensees wishing to deploy new point-to-point links. Thus, adoption of Google's proposal would serve to upset the advantages of the current light-licensing framework where coordination is done on a link-by-

[22] Comments of Google at 4.

link basis and the potential deployment of fixed links in the 70/80 GHz Bands by a multitude of users is maximized.

In any event, the Commission cannot resolve this issue now. Google's suggestion to modify the existing fixed-services licensing and coordination framework goes beyond the scope of the instant proceeding. Google's proposal is not in response to any element of what was proposed or raised in the *Further Notice,* which was whether and how to introduce flexible mobile use in the 70/80 GHz Bands. Thus, the suggestion Google makes would require a new notice of proposed rulemaking before the Commission could consider it further.

5. The Commission Should Not Take Any Action with Regard to Satellite Users or Unlicensed Devices Operating in the 70/80 GHz Bands at This Time

A number of the commenters from the satellite industry ask the Commission to act to preserve prospects for the *eventual* future introduction of satellite services in the 70/80 GHz Bands.[23] While there is a non-Federal allocation to the fixed satellite services in each of the 71-76 GHz and 81-86 GHz bands, there are no licensees. Indeed, there are no service rules for satellite services, and Boeing acknowledges that "currently-available technology does not support the operation of broadband satellite systems in these very high frequencies."[24] On the other hand, tens of thousands of fixed services links have been registered by hundreds of licensees, and both numbers can be expected to grow. The introduction of satellite services in the bands is not ripe at this time or expected any time soon, and none of the satellite use advocates even argue to the contrary. The introduction of satellite service in the indefinite

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[23] *See, e.g.,* Comments of the Satellite Industry Association at 20 ("[T]there is ample reason and time for the Commission to allow flexibility while technology and consumer demand for higher frequency mmW band services develop *over the next several years*, . . . ") (emphasis added); Comments of ViaSat at 16 ("urges the Commission to plan for long-term satellite use of these bands," i.e., 70 GHz/80 GHz and higher frequencies").

[24] Comments of Boeing at 6.

future, should it ever occur, must accommodate and protect the very real existing fixed wireless licensees and their growing use of the band.

Further, the record does not support the introduction of unlicensed operations into the 70/80 GHz bands. Numerous commenters reiterated the position taken by Collinear Networks that unlicensed operations are unsuitable for this band.[25] Rather, as Collinear Networks and other parties noted, there is sufficient opportunity for unlicensed operation in nearby bands, such as the 57-71 GHz band.[26] Proponents of introducing unlicensed operations into the 70/80 GHz Bands have failed to explain why these opportunities are not sufficient to accommodate likely unlicensed devices in this general area of the radio frequency spectrum.[27]

CONCLUSION

For the foregoing reasons and those set forth in the initial comments of Collinear Networks, the Commission should decline to modify the regulatory framework in the 70/80 GHz

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[25] *See, e.g.,* Comments of TIA at 15 ("[T]he Commission should not permit unlicensed indoor-only use in these bands. At such an early stage, additional studies are still needed before any mobile applications can be permitted, let alone unlicensed use. Moreover, the risk for interference to outdoor backhaul from indoor uses needs more study before implementation."); Comments of Fastback Networks at 3 ("We do not believe that it is advisable to open this 70/80 GHz band to either 'indoor use' or any other use that would encourage 'non-directional' antennas."); Comments of Nokia at 11-14; Comments of Qualcomm at 12 ("Additional study is needed before unlicensed use in the 70/80 GHz band, even indoors, can be authorized.").

[26] *See, e.g.,* Comments of TIA at 15 ("availability of 14 GHz of contiguous unlicensed millimeter-wave spectrum between 57-71 GHz is quite sufficient."); comments of Huawei ("unlicensed (for indoor) use of this band is unnecessary in light of the additional 7 GHz of unlicensed spectrum designated for the 64-71 GHz band in the R&O together with the 92-95 GHz band"); Comments of Qualcomm at 12 ("availability of 14 GHz of unlicensed spectrum in the 60 GHz band should be sufficient for indoor operations at the present time."); Comments of 5G Americas at 7 ("Considering that unlicensed use now has access to 14 GHz of spectrum in the expanded 60 GHz band, we do not see a compelling need to subject the 70/80 GHz band to this type of mixed use, especially in light of the passage of time since the designation of the ISM band in 57-64 GHz, and the relative sparsity of use of that unlicensed band.").

[27] *See, generally,* Comments of NCTA at 8; Comments of Microsoft; Comments of the Dynamic Spectrum Alliance at 7.

Bands as proposed in the *Further Notice* at this time. By promptly issuing an order terminating this proceeding in part with regard to possible modifications to the 70/80 GHz Bands, the Commission will minimize any potential chilling effect on the continued development and deployment of high-capacity fixed services technologies and equipment in the bands.

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